REMARKS

The Office Action dated September 6, 2007 has been received and carefully noted. The following remarks are submitted as a full and complete response thereto. Claims 1-19 are currently pending in the application and are respectfully submitted for consideration.

Claims 1, 2, 8, and 10 were rejected under 35 U.S.C. §102(b) as being anticipated by Pikkarainen (U.S. Patent No. 5,701,106). This rejection is respectfully traversed for at least the following reasons.

Claim 1, upon which claims 2-9 are dependent, recites a method which includes performing delta sigma modulation on a digital quadrature signal, converting the modulated signal to an analog signal, converting the analog signal to an RF signal, and transmitting the RF signal.

Claim 10 recites a system including means for performing delta sigma modulation on a digital quadrature signal, means for converting the modulated signal to an analog signal, means for converting the analog signal to an RF signal, and means for transmitting the RF signal.

Therefore, embodiments of the invention provide a system and method that use less hardware and power than conventional transmitters without substantially reducing clarity of the data carried in the RF signals.

As will be discussed below, Pikkarainen fails to disclose or suggest all of the elements of the claims, and therefore fails to provide the advantages/features discussed above.

Pikkarainen discloses a modulation method and modulator with which a complex signal can be modulated and shifted directly from the baseband frequency to an intermediate frequency or even directly from the baseband frequency to the transmission frequency. This is achieved by taking samples from the incoming bit stream with a D/A converter, preferably a sigma-delta type D/A converter, and selecting as output directly a multiple of the sampling frequency provided by the D/A converter. The conversion produces a baseband signal and signals at multiples of the sampling frequency. The sampling frequency is increased, according to a sigma-delta D/A conversion, and one of the signals at multiples of the sampling frequency, produced by the conversion, is selected as the output signal. A multiple at the D/A converter output that is at the desired intermediate frequency or at the transmission frequency is selected.

Applicants respectfully submit that Pikkarainen fails to disclose or suggest all of the elements of the present claims. For example, Pikkarainen does not disclose or suggest, at least, "converting the analog signal to an RF signal; and transmitting the RF signal," as recited in claim 1 and similarly recited in claim 10. According to embodiments of the invention, as illustrated in Fig. 2 of the application, the DACs 250a and 250b convert the digital signals to analog signals. The LPFs 260a and 260b receive the analog signals and filter out any glitches to generate a continuous signal. The mixers

270a and 270b convert the analog signals to an RF signal (e.g., 2.4 GHz for Bluetooth), which is then amplified by the power amplifier 280 and transmitted by the antenna 290 (Specification, paragraph 0026).

Pikkarainen, on the other hand, does not disclose or suggest converting the analog signal to an RF signal and transmitting the RF signal, as recited in the present claims. Rather, Pikkarainen merely discloses feeding digital I and Q signals to a digital interpolation/filter block 90 (Pikkarainen, Column 5, lines 40-45). The signals obtained from the interpolators/sinc filters 90 are taken to sigma-delta modulators 91, which provide at their output 1-bit signals (Pikkarainen, Column 5, lines 54-60). Following the sigma-delta modulator 91, a 90-degree phase shifter 76 is added to the Q branch. The 1-bit I and Q signals with a 90-degree phase shift are then taken in their own branches to 1-bit D/A converters 92 that provide analog output signals which are summed in adder 95 (Pikkarainen, Column 6, lines 10-19). However, Pikkarainen fails to disclose or suggest converting the analog output signal into an RF signal and transmitting the RF signal.

Therefore, Pikkarainen fails to disclose or suggest all of the elements of claims 1 and 10. As such, Applicants respectfully request that the rejection of claims 1 and 10 be withdrawn.

Claims 2 and 8 are dependent upon claim 1. Thus, claims 2 and 8 should be allowed for at least their dependence upon claim 1, and for the specific limitations recited therein.

Claims 5, 11, 12, 15 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Pikkarainen. This rejection is respectfully traversed for at least the following reasons.

Applicants submit that Pikkarainen fails to disclose or suggest all of the elements of the presently pending claims. For instance, Pikkarainen does not disclose or suggest "a mixer, communicatively coupled to the DAC, capable of converting the analog signal to an RF signal; and an antenna, communicatively coupled to the mixer, capable of transmitting the RF signal," as recited in claim 11. As discussed above, Pikkarainen merely discloses providing a digital-to-analog converter for sampling a baseband digital signal at a certain sampling frequency and converting it into an analog signal. However, Pikkarainen fails to disclose or suggest a mixer, coupled to the converter, capable of converting the analog output signal into an RF signal and an antenna capable of transmitting the RF signal.

Furthermore, Applicants submit that it would not have been obvious to a person of skill in the art to modify Pikkarainen to yield the present invention. Pikkarainen merely contemplates the provision of a modulator for modulating the digital signal. The objective of Pikkarainen is to provide an output signal from the digital-to-analog converter. Pikkarainen does not contemplate the use of a transmitter or the conversion of the analog signal to an RF signal. Accordingly, it would not have been obvious to a person of skill in the art to modify Pikkarainen to yield the claimed invention. Therefore, Applicants submit that Pikkarainen fails to render claim 11 as obvious.

Claims 5, 12, 15 and 18 are dependent upon claims 1 and 11, respectively. As discussed above, Pikkarainen fails to disclose or suggest all of the elements of claims 1 and 11. Therefore, claims 5, 12, 15, and 18 should be allowed for at least their dependence upon claims 1 and 11, and for the specific limitations recited therein.

The Office Action rejected claims 3, 4, 13, and 14 under 35 U.S.C. §103(a) as being unpatentable over Pikkarainen in view of Lipka (U.S. Patent No. 7,227,910). The Office Action took the position that Pikkarainen discloses all of the limitations of the claims, with the exception of reducing the number of bits from 10 to 4 and amplifying the RF signal before transmitting. The Office Action then cited Lipka as allegedly curing these deficiencies in Pikkarainen. This rejection is respectfully traversed for at least the following reasons.

Pikkarainen is discussed above. Lipka discloses providing sigma-delta modulators with a configurable output bit width so that the output bit width of the interpolation filters can be easily adapted to the input bit width of a chosen digital-to-analogue converter without the need to change the internal design of a baseband processing circuit.

Claims 3, 4, 13, and 14 are dependent upon claims 1 and 11, respectively. As discussed above, Pikkarainen fails to disclose or suggest all of the elements of claims 1 and 11. Furthermore, Lipka fails to cure the deficiencies in Pikkarainen as Lipka also fails to disclose or suggest converting the analog output signal into an RF signal and transmitting the RF signal. Thus, the combination of Pikkarainen and Lipka does not disclose or suggest all of the elements of claims 3, 4, 13, and 14. Additionally, claims 3,

4, 13, and 14 should be allowed for at least their dependence upon claims 1 and 11, and for the specific limitations recited therein.

Claim 6 was rejected under 35 U.S.C. §103(a) as being unpatentable over Pikkarainen in view of Hossack (U.S. Patent No. 6,819,276). The Office Action took the position that Pikkarainen discloses all of the elements of the claim, with the exception of coding the modulated signal with a thermometer code. The Office Action then cited Hossack as allegedly curing this deficiency in Pikkarainen. This rejection is respectfully traversed for at least the following reasons.

Pikkarainen is discussed above. Hossack discloses a noise-shaper system which includes a scrambler coupled to receive the output of a randomizer. The randomizer has an input for receiving a plurality of parallel equally weighted bits in a first sequence, and a first output which provides said bits in a pseudorandom sequence with a transformation that is not dependant on said first sequence. The scrambler is coupled to receive the randomizer's output and, in response, to produce a second non-pseudorandom sequence of the bits at a second output with a transformation that is dependent on the pseudorandom sequence. The resultant output is noise shaped to reduce distortion.

Claim 6 is dependent upon claim 1. As discussed above, Pikkarainen fails to disclose or suggest all of the elements of claim 1. Furthermore, Hossack fails to cure the deficiencies in Pikkarainen as Hossack also fails to disclose or suggest converting the analog output signal into an RF signal and transmitting the RF signal. Thus, the combination of Pikkarainen and Hossack does not disclose or suggest all of the elements

of claim 6. Additionally, claim 6 should be allowed for at least its dependence upon claim 1, and for the specific limitations recited therein.

Claims 7 and 17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Pikkarainen in view of Norsworthy (U.S. Patent No. 5,512,898). The Office Action took the position that Pikkarainen discloses all of the elements of the claims, with the exception of modulating the quadrature signal prior to performing delta sigma modulation. The Office Action then cited Norsworthy as allegedly curing this deficiency in Pikkarainen. This rejection is respectfully traversed for at least the following reasons.

Pikkarainen is discussed above. Norsworthy discloses a data converter which includes an analog-to-digital converter for converting an incoming analog signal into a plurality of digital signal samples, followed by a minimum phase FIR filter to filter the digital signal samples. Alternatively, the data converter includes a digital-to-analog converter preceded by a minimum phase FIR filter to filter a plurality of digital signal samples that are converted into an analog signal by the digital-to-analog converter. The data converter may include both analog-to-digital and digital-to-analog conversion.

Claims 7 and 17 are dependent upon claims 1 and 11, respectively. As discussed above, Pikkarainen fails to disclose or suggest all of the elements of claims 1 and 11. Furthermore, Norsworthy fails to cure the deficiencies in Pikkarainen as Norsworthy also fails to disclose or suggest converting the analog output signal into an RF signal and transmitting the RF signal. Thus, the combination of Pikkarainen and Norsworthy does not disclose or suggest all of the elements of claims 7 and 17. Additionally, claims 7 and

17 should be allowed for at least their dependence upon claims 1 and 11, and for the specific limitations recited therein.

Claims 9 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Pikkarainen in view of Fujimori (U.S. Patent No. 6,326,912). The Office Action took the position that Pikkarainen discloses all of the elements of the claims, with the exception of the interpolation filtering reducing the digital quadrature signal from 12 bits to 10 bits. The Office Action then cited Fujimori as allegedly curing this deficiency in Pikkarainen. This rejection is respectfully traversed for at least the following reasons.

Pikkarainen is discussed above. Fujimori discloses an analog-to-digital converter for converting an analog signal to a one-bit digital bit stream. The analog-to-digital converter uses a multi-bit analog delta-sigma modulator coupled to receive the analog input signal, and a one-bit digital delta-sigma modulator coupled to receive the digital output from the multi-bit analog delta-sigma modulator. The analog delta-sigma modulator uses a multi-bit quantizer having minimal quantization noise, and the digital delta-sigma modulator converts the multi-bit quantizer output into a single bit delta-sigma digital format compatible with digital audio systems which require a one-bit delta-sigma format.

Claims 9 and 19 are dependent upon claims 1 and 11, respectively. As discussed above, Pikkarainen fails to disclose or suggest all of the elements of claims 1 and 11. Furthermore, Fujimori fails to cure the deficiencies in Pikkarainen as Fujimori also fails to disclose or suggest converting the analog output signal into an RF signal and

transmitting the RF signal. Thus, the combination of Pikkarainen and Fujimori does not disclose or suggest all of the elements of claims 9 and 19. Additionally, claims 9 and 19 should be allowed for at least their dependence upon claims 1 and 11, and for the specific limitations recited therein.

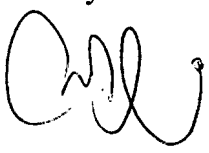
Applicants note that claim 16 was not rejected over any prior art. Accordingly, Applicants assume that claim 16 is in condition for allowance. If claim 16 is not allowable and a subsequent rejection of claim 16 is made, Applicants respectfully request that a new non-final Office Action be issued to allow the Applicants an opportunity to address the patentability of claim 16.

Applicants respectfully submit that the cited prior art fails to disclose or suggest all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-19 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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